Ohio Agricultural Experiment Station.

BULLETIN 65.

WOOSTER, OHIO, DECEMBER, 1895

POTATOES.

COMPARISON OF VARIETIES.

EXPERIMENTS WITH FERTILIZERS.

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BULLETIN

OF THE

Ohio Agricultural Experiment Station.

NUMBER 65. December, 1895.

VARIETY TRIALS OF POTATOES.

BY W. J. GREEN AND H. O. MCFADDEN.

Since the removal of the Station from Columbus variety tests of potatoes have been carried on as before, but no report of the work done here has been made. In 1893 the trials were made on quite a small scale, but in 1894 and 1895 the plot areas were enlarged, and the work duplicated. The size of the plot is now the $\frac{1}{60}$ part of an acre, and each variety is planted in two different parts of the field, except such new sorts as are sent in for trial in quantities too small for duplication.

That this plan is more satisfactory than very small plots, without duplication, is now evident. Two sub-stations, one in Fulton county, on sandy soil, and the other in Cuyahoga county, on a very heavy clay soil, are now in operation, and the same work is carried on at these places. Just how much of general value there is in variety testing of potatoes is a question not easily answered. It is well known that any given variety may vary in yield in separate trials, and it is sometimes assumed that differences in soil are responsible for the greater part of these variations, hence it is declared that a test on one soil is no criterion of what a variety may do on another. The logical inference is that each one must learn for himself just what varieties are suited to his soil, as the experience of others is worth nothing to him. Any one who undertakes to make a careful test of any list of varieties of potatoes will find that duplicate trials on the same soil, in the same or consecutive seasons, will not agree in placing the varieties in the same consecutive order in yield. We have found almost as great a variation in varieties in one field as on different classes of soil. This shows that there are other causes of variations besides differences of soil.

One hill may yield double the quantity of another hill alongside. It is not necessary to discuss these causes of variation, but it is sufficient

to say that they are numerous and complicated, and that it is impossible to separate them, so as to show the proportional effect of each. This makes it appear as though it were impossible for a variety test of potatoes to have either general or local value. That is, no one can find out to a certainty what variety is best adapted to his soil, if the result of one trial contradicts that of another. This conclusion seems absurd, for different growers do, in some manner, find out which are the best varieties.

This reasoning leads to a false conclusion because it unduly magnifies certain facts and ignores others.

The effect of different classes of soil in causing variation is overrated; the inherent tendency of varieties to vary is not considered at all; nor is the fact that all varieties are not alike in degree of variability.

Some varieties are almost invariably at the head of the list in yield, while others are as constantly at the foot. In our trials the Early Ohio has never, in any soil or season, risen to the head of the list in yield, nor even up to the average, while the reverse is true of the American Wonder. With these might be grouped many other varieties which have invariably kept a place either near the head or the foot of the list. There are others which have pretty constantly held an intermediate place, while there are still others that have fluctuated so widely as to defy grouping.

A variety trial must be looked upon as an item of evidence concerning each variety under consideration. A great many such items, from different sources, must be accumulated before a conclusion can be reached, and it is an undeniable fact that one can reach a conclusion more quickly by comparing the results of others with his own than by working alone.

This report is offered as evidence regarding the behavior of varieties here and at the sub-stations. It gives evidence that certain varieties are much more prolific than others; that some are more susceptible to blight than others, at least that some resist the disease a longer time than others; that certain varieties bear so close a resemblance to others as to be indistinguishable; that many claims of seedmen regarding the varieties offered cannot be substantiated, besides items on other minor points.

Any one who takes this evidence as conclusive may make a mistake, just as he might if he were to draw conclusions from one season's trial of his own. On the other hand, this evidence may be useful to any one who puts it alongside of his own experience, and it may be helpful to any one without experience, in serving to direct attention to certain characteristics of varieties.

Any variety trial is useful in so far as it offers trustworthy evidence, and a combination of local results is sure to bring out some facts of general value. The general value of any single trial of varieties is very small, standing alone. It needs corroboration, before we can determine what it is

worth. If the soil were the principal factor in causing variation, or if all varieties were fickle alike, there would be none adapted to large areas of country; but the fact that there are kinds which do well on different soils, and that these are the best locally, makes it an incentive to determine as quickly as possible to which class new sorts belong, whether to the fickle or reliable. The purpose of a variety trial here is not to determine this point, but to help to determine it. The results are suggestive merely, and ought not to be taken in any other way. The principal object in offering these remarks is that these results may be taken as suggestive and tentative, rather than as conclusive and final.

In Table I is given a list of varieties grown in 1895, with yields in bushels per acre:

TABLE I.—COMPARISON OF VARIETIES OF POTATOES.

Variety.	Yield per acre.	Variety.	Yield per acre.
American Wonder	276	Maggie Murphy	238
Acme	272	Maule's Thoroughbred	357
Algoma	209	New Queen	254
Banner	201	Nebula	266
Brownell's Winner	243	New Northern	268
Bovee	358	New Burbank	237
Carman No. 1	262	Onward	236
" No. 3	224	Oregon Pearl	235
Columbus	281	Pennsylvania's Best	283
Clay Rose	214	Penn Manor	252
Craig	211	Peerless Jr	261
Early Rose	217	Parker's Market	228
" Norther	270	Rural New Yorker No. 2	213
" Cyclone	261	Somerset	248
" Morn	281	Sir William	308
" Oxford	294	Stoneroads No. 1	258
" Harvest	290	" No. 2	288
" Pinkeye	270	Salzer's Prize taker	154
" Ohio	207	" Earliest	177
" Puritan	298	Shamrock	185
" Everitt	274	Timpee's No. 4	223
Everitt's Six Weeks	202	Thorburn	242
Empire State	312	Vick's White Gem	159
Freeman	237	" Early Pride	292
Forest Rose	304	" " Prize	282
Gov. Rusk	251	Victor Rose	244
Great Divide	215	Van Orman's Superb	236
Green Mountain	286	" " Earliest	249
Heavy Weight	240	" " No. 99	224
Harvest King	210	World's Fair	266
Irish Daisy	247	Wisconsin Beauty	269
Illinois Queen	229	Wolfgang	330
Koshkonong	309	Wood's Earliest	269
King of the Mammoths	330	Wise	323
King of the Earliest	200	Wilson's First Choice	232
Lightning Express	221		

The planting was done May 16, 17 and 19. The potatoes were cut to two eyes and dropped, one piece in a place, 16 inches apart, in rows 33½ inches apart. The soil is a clay loam, with sufficient sand to render it friable and easily tillable, and is known as oak and chestnut land. The land was cleared in the winter of 1893-94 and cropped with corn in 1894. Each row contained 204 hills, and all of the varieties were planted in duplicate, except a few of the new kinds, sent in for trial. The average yields are given in the table. The total yields of large and small are given, and in most cases the per cent. of small is stated under notes on varieties. Except in two or three cases the per cent. of small was not very great, although the season was uncommonly dry. Level cultivation was given. The same methods have been followed at the sub-stations, and in other seasons.

Since a number of varieties were added to the list in 1895 it is not possible to make a comparison for the years 1894-95 throughout, but a list of those grown in both seasons is given in Table II. The yield in 1894 was much less than in 1895, and none reached the same mark in the first as in the latter season.

The varieties which stood above the average in both seasons are American Wonder, Columbus, Carman No. 1, Early Norther, Forest Rose, Irish Daisy, King of the Mammoths, Koshkonong, Stoneroad's Nos. 1 and 2, Sir William, Van Orman's Superb, Victor Rose, Wilson's First Choice, World's Fair, Wisconsin Beauty. All of these varieties were not on the list in 1893, but the American Wonder, Columbus, Early Norther, King of the Mammoths, Koshkonong, Stoneroad's Nos. 1 and 2 and Wilson's First Choice stood above the average in all cases. None of the others were on trial in 1893, except World's Fair, and it fell slightly below the average for that season. Those which have for two or three seasons fallen below the average are Badger Bell, Burpee's Extra Early, Crown Jewel, Early Ohio, Everitt's Six Weeks, Minister, Salzer's Earliest.

In Table III is a comparison of varieties which were grown at the Central Station, and at the North Western and North Eastern Sub-Station, near Neapolis P. O., and in Strongsville township, Cuyahoga county.

The soil at Neapolis is sandy and the region is known as the "Oak Openings." It has been newly cleared, and cropped one season. The higher portions of the field are of yellow sand, and the lower of black sand.

The rows of potatoes extended across the black sand, both ends being on the yellow sand. The yield was calculated on the rows entire. This gave an average of about 92 bushels per acre, but on the black sand it was 116.

TABLE II.—Comparison of Varieties of Potatoes for 1894 and 1895.

Variety.	Yields per acre.		
	1894.	1895.	Average for two season.
	Bushels.	*Bushels.*	*Bushels.*
American Wonder	169	276	222
Banner	117	201	159
Columbus	182	281	231
Carman No. 1	141	262	201
Clay Rose	155	214	184
Early Norther	130	270	200
" Rose	120	217	168
" Puritan	87	298	192
" Ohio	67	207	137
" Harvest	95	290	192
Everitt's Six Weeks	75	202	138
Freeman	87	237	162
Forest Rose	134	304	219
Irish Daisy	129	247	188
Illinois Queen	71	229	150
King of the Mammoths	149	330	239
Koshkonong	119	309	214
Maggie Murphy	112	238	175
New Burbank	116	237	176
New Queen	99	254	176
Nebula	96	266	181
Pennsylvania's Best	107	283	195
Penn Manor	96	252	174
Rural New Yorker No. 2	138	213	175
Stoneroad's No. 1	134	258	196
" No. 2	115	288	201
Salzer's Earliest	55	177	116
Sir William	144	308	226
Van Orman's Earliest	97	249	173
" " Superb	129	236	182
Vick's White Gem	69	159	114
Victor Rose	121	244	182
Wilson's First Choice	135	232	183
World's Fair	126	266	196
Wisconsin Beauty	139	269	204

The soil at Strongsville is a heavy clay, much below the average soils of the state in fertility. The only place available for potatoes was a timothy sod, which could not be gotten into good condition for potatoes, which partly explains the wide variations in yields.

Neither of these sub-station trials of varieties was satisfactory, not because of low yields, but because the soil could not be brought into the proper condition to insure uniformity, and this is especially true of the Northeast Sub-Station. Both present some interesting facts regarding the ability of certain varieties to yield crops under unfavorable conditions.

TABLE III. YIELDS OF VARIETIES OF POTATOES AT THE CENTRAL STATION AND SUB-STATIONS IN 1895.

Variety.	Yield per acre.			
	Central Station.	N. W. Sub-Sta.	N. E. Sub-Sta.	Average.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
American Wonder	276	94	106	159
Banner	201	81	68	117
Carman No. 1	262	93	76	144
Columbus	281	121	112	171
Clay Rose	214	78	74	122
Early Norther	270	77	66	138
Early Cyclone	261	92	80	144
Early Harvest	290	82	63	145
Everitt's Six Weeks	202	76	74	117
Forest Rose	304	77	76	152
Irish Daisy	247	94	169	170
Koshkonong	309	108	115	177
Maggie Murphy	238	76	68	127
Nebula	266	77	68	144
New Burbank	237	73	95	135
Pennsylvania's Best	283	103	114	167
Penn Manor	252	104	88	148
Rural New Yorker No. 2	213	108	104	142
Sir William	308	115	154	192
Stoneroad's No. 2	288	105	145	180
Timpee's No. 4	223	85	106	138
Victor Rose	244	101	62	136
Van Orman's Earliest	249	93	36	157
World's Fair	266	85	95	149

Among the varieties which stood above the average in a two season's trial at the Central Station, we find at both sub-stations, American Wonder, Columbus, Irish Daisy, Koshkonong, Sir William and Stoneroad's No. 2. Carman No. 1, Early Norther, Forest Rose and Victor Rose dropped slightly below the average at either one place or the other, although the greatest falling off was at Strongsville.

Irish Daisy seemed to endure hardship the best of any, but since it gave a larger percent of small potatoes than any other the Sir William is really at the head. In a two season's trial at Neapolis, Burpee's Extra Early has excelled the Early Norther, the reverse of the results at Wooster. This is the only really anomalous case of the kind, although Everitt's Six Weeks and Nebula approach it. It will not do to hastily conclude that the Early Norther and Nebula are not suited to a sandy soil, for both gave low yields at Strongsville, on a clay soil.

There are a number of varieties which have, in all our trials, occupied intermediate places in yield, neither reaching very near to the top

nor falling close to the bottom. Among these may be named Clay Rose, Early Rose, Maggie Murphy, New Queen and Rural New Yorker No. 2.

Nothing is more clear than the fact that there are comparatively few varieties that show any great degree of uniformity and that all are not alike in this particular. That stable varieties are more valuable than those which fluctuate widely hardly needs to be said, and yet we have evidence that most people are anxious to get the variety which yielded the highest in a given trial, and often are ready to discard old reliable sorts, and to buy new kinds at high prices, which are reported as yielding three or four times as much as their own.

SECOND CROP SOUTHERN SEED VS. NORTHERN SEED.

In 1893 second crop seed of the following varieties was procured from Maryland and of the same varieties from both Maine and Wisconsin: Early Rose, New Queen, Burpee's Extra Early and Crown Jewel.

Owing to unfavorable weather the planting was delayed for some time after the potatoes were received. Those which came from Maine and Wisconsin sprouted considerably, while the second crop seed showed almost no signs of sprouting. The seed was all in excellent condition when received, and was of the best quality in every particular. The yield was slightly in favor of the second crop seed except in the case of the Early Rose. The average was slightly in favor of the northern seed, the rate of yield per acre being 170 bushels from second crop seed and 171 from northern seed. In 1894 the crop from the southern seed was at the rate of 105 bushels per acre and 102 from the northern seed. The experiment was not repeated in 1895.

These results are not conclusive, nor do they afford any basis for generalization.

The slow sprouting of the southern second crop seed is in its favor. The potatoes average smaller than those from the north, hence if cut with the same number of eyes to the piece will go farther in planting. We have not been able to note that difference in earliness of crop in favor of the second crop seed, which has been claimed. On the whole it does not appear that second crop seed is superior for this latitude to northern seed, although it may be for sections further south. More extended experiments are really needed to settle the question, however.

Our own seed, if well kept, appears to be as good as either northern or southern seed. By planting late, about the first of July, it is possible to grow potatoes for seed here, which appear to have a greater value for seed purposes than the crop which is grown at the usual season.

Experiments to test this matter have been started.

NOTES ON VARIETIES.

American Wonder. A comparatively new midseason variety of great value. The vines are vigorous and do not blight as quickly as most kinds, but are not exempt. It is one of the most prolific varieties, standing near the head of the list in all our trials. The potatoes are white; medium to large; quite uniform in size and regular in shape. It has been sold, even quite recently, at exorbitant prices by agents, but those who received genuine stock in this manner secured a better bargain than is usual in such cases. It keeps well and is of good quality.

Acme (Seedling) (Vaughan). Closely resembles Early Ohio in appearance of tubers, but is a stronger grower, and perhaps more prolific. Vaughan says of it, "The Acme Seedling is fully a week in advance of any other kind in earliness." It appears to rank with Early Ohio in earliness here, but is not quite as early as Bliss' Triumph. It has been grown here only one season, and in small quantity, but it appears to rank with the best early sorts, and it may be regarded as promising. Although the tubers are of fair size the per cent. of small potatoes, as in the Early Ohio, was quite large, viz.: 19. If it should prove to be superior to Early Ohio it will be in vigor and productiveness. Quality good. Keeps better than most early varieties.

Banner (Livingston). A second-early variety, of recognized merit. It bears a close resemblance to the Rural New Yorker No. 2, Peerless Jr., Harvest King and Carman No. 3, both in appearance of plants and tubers, although of distinct origin. It occupies an intermediate place in point of productiveness, and in all our trials has stood near, but a little below the Rural New Yorker No. 2.

Bovee M. An unnamed variety, sent for trial by Mr. Bovee of Michigan. Judging from one season's trial this is a very promising variety, but a longer time is needed to determine its value. Season, early to medium; plants very vigorous in growth, resists blight well, but not exempt. Very prolific, as indicated by one season's trial. The tubers are medium to large, of medium length and somewhat flattened; sometimes nearly oval in outline; eyes variable in size, but mostly shallow; color pink. Quality good. Aside from a tendency to grow prongy this is an uncommonly promising variety. 15 per cent. small.

Carman No. 1 (Thorburn). A valuable midseason variety. More prolific and vigorous in growth than the Rural New Yorker No. 2 has been here, but has blighted earlier in the season. The tubers are medium to large in size, usually oval in outline, but sometimes the ends are nearly square; somewhat longer than the Rural New Yorker No. 2. Color white with more or less russet; eyes shallow. In our trials it has fallen some-

what below the most prolific sorts in yield, but it has given good crops. 12 per cent. of the crop was graded as small last season. A good keeper but not always of the best quality.

Carman No. 3 (Thorburn). Resembles the Rural New Yorker No. 2 very closely in appearance of both plants and tubers. The potatoes received from the introducer, however, were much longer and quite distinct from the above variety, but as grown here, the past season, the two varieties seem to be very similar in every particular. There is possibly some difference in favor of Carman No. 3 in both vigor of growth and yield. It appears to resist blight better than Carman No. 1, but is not exempt from that disease. The quality was not satisfactory this season.

Columbus. This variety has uniformly given good yields here, and ranks among the most prolific sorts. The tubers are sometimes rough and uneven, but aside from this it is one of the most profitable varieties that has been grown here.

Clay Rose (Dibble). A second early variety; quite distinct in habit of growth; vigorous but only moderately prolific. Dibble says that it is so desirable in color and form that it will sell in market for Early Rose, but we find it quite different from the Early Rose in appearance, and decidedly inferior. He also says that it may be considered as blight proof, but it has blighted here. Judging from the results of two season's trials, it appears to have no qualities of great value.

Craig (Root). A late variety of vigorous habit of growth. Judging from reports it is very prolific, but the yield was small here, as the vines were almost killed by blight before the middle of August. In form the tubers are short, often nearly spherical, but usually slightly flattened. Rather rough and uneven, with a depression at the stem end. Eyes rather deep; skin pink. In spite of the fact that the vines were killed by blight, which prevented the proper maturing of the crop, there were only eight per cent. of tubers below marketable size. The principal objections to the variety are its lateness, also color and form of tubers. No doubt it will prove to be a great cropper wherever it ripens before blighting.

Early Norther. This is the most promising variety of the Rose class that has been tested here for any considerable period. In form and color it resembles the Early Rose, but is more prolific. On the sandy soil of the sub-station at Neapolis it has not been as satisfactory as some other early sorts, notably Burpee's Extra Early, but on clay soil it has given satisfaction as far as known. In quality it is unexcelled, and keeps as well as any of its class.

Early Everitt (Everitt). This is another promising variety of the Rose family. It compares favorably with Early Norther in yield, and is

rather smoother, hence presents a better appearance. It is a strong competitor of that variety.

Early Cyclone (Salzer). Resembles the Early Harvest, but has given a smaller yield here. Salzer claims that it will yield three times as much as Early Ohio, or Early Rose, but it has about equalled the latter, and slightly exceeded the former here. He claims also that is earlier than either of these varieties by eight to twelve days, but in our trials it has ripened with the Early Rose. In fact, our trials have not substantiated any of the claims made for it. We must admit that it is a good variety, however.

Early Morn (May). May does not give a description in his catalogue by which we may judge whether this is a white or pink potato, and as tubers of both colors were in the lot sent here it was taken for granted that the unfamiliar kind was Early Morn, especially as the other was identified as Early Ohio. May says that the Early Morn is the earliest potato in the world, but it is not so here, nor does it appear to possess many specially valuable qualities Quality excellent.

Early Harvest (Jerrard). An early white variety of great value. Our trials do not substantiate Jerrard's claim that it is earlier than any other potato that is grown, but it appears to be about as early as Early Rose and Early Puritan. It stands near the head of the list among early white sorts in vigor, productiveness and quality.

Early Pinkeye (Read). Ripens with Early Harvest. Vines rather spindling in growth and subject to blight. Tubers rather short, often nearly oval, flattened; eyes pink, shallow; skin nearly white. A fine potato, but often uneven and irregular. Compares favorably in yield with other early sorts. Quality good, but does not keep well.

Everitt's Six Weeks (Everitt). Just wherein this variety differs from Early Ohio and Ohio Junior seems not to have been made clear by the disseminators nor by any one else. No. 177, grown by the Station, and given to the public several years ago, is another of the same class, and possibly more prolific than any of the others. No doubt half a dozen varieties of this class are in existence, and although of distinct origin are practically identical. They rank next to Bliss' Triumph in earliness, but excel those of that class in prolificacy, and yet are not sufficiently productive to meet the general demands for an early variety. For special purposes the Early Ohio class is invaluable, and it matters but little under what variety name the stock is secured, except that there seems to be a growing difficulty in securing pure seed of the Early Ohio, and for this reason it may sometimes be advisable to purchase stock under one of the other names.

Freemen. This variety is widely and favorably known because of its good table qualities. Comparatively few have succeeded in getting good

yields with it, because it requires a rich soil and high cultivation. It sets a comparatively large number of tubers, hence the seed must be cut to one eye and the best possible conditions furnished, or a large per cent. of the crop will be small. The per cent. of small potatoes last season was 26, in spite of the fact that the soil was fertile and the cultivation as good as could be given. This was the highest per cent. of small potatoes of any variety tested.

Forest Rose. A medium early white variety. The vines are vigorous but quite subject to blight. It ranks quite high in productiveness, but the tubers lack uniformity. The best present a beautiful appearance, but taken as a whole they are somewhat dissapointing. The general shape of the tubers is long and almost cylindrical. The two ends are about equal in size and rounded. Eyes shallow. Skin white. Excellent for baking. Per cent. of small, 17.

Great Divide (Burpee). A late white variety, of vigorous habit of growth, ranking medium as to prolificacy. It is said to be blight and scab proof, but we have not found it so, although it does not blight as early as most other kinds. The tubers are uniform in size, regular in shape and present a fine appearance. The keeping and table qualities are good. Although not the most prolific of the varieties tested here it will no doubt prove to be a profitable market sort. The percentage of small was 19 this season, which indicates the habit of setting too many tubers.

Harvest King (Salzer). Salzer says that it is very distinct in appearance, but we were unable to distinguish it from the Rural New Yorker No. 2, either in habit of growth or in appearance of tubers. It may be distinct from that variety in origin, but does not appear to be superior to it in any respect.

Irish Daisy (Maule). A midseason white variety, of vigorous habit of growth; not so much subject to blight as most other sorts, but not entirely resistant. It is a good cropper, but a very large per cent. of the tubers are small, standing next to the Freeman in this particular. Even when the small potatoes are sorted out, leaving only those of marketable size, the general appearance is far from pleasing, because of the rough, uneven character of the tubers. A good keeper, but was not of the best quality this season.

King of the Earliest (Salzer). Resembles the Early Ohio in form and color. It ripens at about the same time as the Early Ohio, and yields about the same. Possibly its growth is more vigorous, while the tubers appear to be rather longer, with deeper eyes. How constant these slight differences are, or whether they exist at all or not, must remain to be determined by further comparison.

Lightning Express (from both Dibble and Salzer). We have been unable to distinguish this variety from Maggie Murphy, as obtained from Dibble, but those from Salzer were mixed.

Maule's Thoroughbred (Maule). This was sent here for trial by Wm. H. Maule, as No. 17. It ripens with the Early Rose. The vines are quite vigorous and slow to blight, but are not exempt. Our trial indicates that it is very prolific, but as we had only fourteen hills, from which the yield per acre was calculated, there is possibility of considerable error, as a slight variation is thus multiplied more than eight hundred times. The tubers are medium to large, of medium length, slightly flattened; often nearly oval in outline; eyes shallow; rose color. This gives indications of being a valuable variety. Quality good.

Maggie Murphy (Vick). A midseason pink potato, of vigorous growth, ranking medium as to productiveness, in our trials. It is not blight proof, as claimed, as our notes show that the vines were badly blighted August 12. The tubers are large and coarse looking, and are not always of the best quality, especially if grown on heavy land. The per cent. of small was low, being only 6. In some markets it would not find a ready sale, because of the color and coarse appearance. Does not sprout quickly.

New Northern (May). A vigorous growing, intermediate variety, claimed by May to be the heaviest yielding potato in the world, but it has not taken that rank here, being considerably below some of the best in yield. The tubers are medium to large, rather long, sometimes nearly cylindrical but usually slightly flattened, eyes shallow, skin white with some russet. Quite uniform and of fine appearance. Quality good, but does not keep as well as some.

Onward (Everitt). A midseason, vigorous growing variety. Does not blight early, but is not resistant. It gave a good yield last season, with only 7 per cent. of unmarketable tubers, but it fell considerably below the most prolific sorts. The tubers are rather long, almost slender, flattened, eyes shallow, skin white, with more or less russet. Quality good; suitable for baking. Although tested but one season it seems safe to rank it as promising.

Pennsylvania's Best (Stoneroad). An early to medium, strong growing variety, resisting blight quite well. Quite prolific; tubers of medium length, slightly flattened, sometimes nearly cylindrical; eyes shallow; rose color; promising. Of good quality, but does not keep as well as most other varieties.

Penn Manor (Johnson & Stokes). Claimed to be earlier and a heavier cropper than the Early Rose, which it resembles, but it has not proved to be superior to that variety here. Does not keep well.

Peerless Jr. (Dibble). This is claimed by Dibble to be an early variety and is said to be blight proof, but it is not early here, nor does it resist blight. It so closely resembles the Rural New Yorker No 2 that the same description answers for both. Just wherein the two varieties differ remains for further comparison to show. According to Dibble it has a distinct origin, but that does not prove its superiority.

Parker's Market (Jerrard). A second early, rose colored variety, of vigorous growth and moderate productiveness. It is not exempt from blight, but does not succumb early. Tubers rather short and nearly oval in outline, ends often nearly square; eyes shallow; skin rose color.

Rural New Yorker No. 2. A well known, intermediate, white variety. In yield it falls below some of the most prolific, and the quality is not always first class, but in general reliability it is hardly excelled. Six per cent. of the crop was small.

Somerset (Jerrard). A midseason variety of great vigor, comparatively free from blight, but not wholly exempt. It will probably take rank above medium as to productiveness, but it barely reached that point here last season. The tubers are quite short, considerably flattened; eyes rather deep; skin rose color. No doubt this will prove to be a valuable variety, although in some markets potatoes of this description are not in demand, and sell for less than white skinned sorts. Eight per cent. of the crop was unmarketable. Quality excellent.

Salzer's Earliest (Salzer). We have been unable to find any difference between this and Stray Beauty, or Bliss' Triumph. It is very early, but a light cropper.

Sir William (Burr). A vigorous and prolific late white variety. It resisted blight longer last season than most varieties, and the yield was considerably above the average, but not quite equal to that of the best. Complaint has been heard that the tubers are coarse in appearance and poor in quality, but we have found none to be superior to it in quality, and but few equal to it in appearance. It is an almost ideal potato, both for home use and for market. It stands in the list of the very few varieties which have, for two seasons, given the highest yields on both old and new ground at the Central Station in Wayne county, on the thin, sandy soil in Fulton county, and the heavy clay in Cuyahoga county. These trials indicate that it will respond to good treatment, almost equally with the heaviest cropping varieties, and will endure hardship better than the average. There are some early and medium varieties equal to it in quality, but it excels most, if not all, of the heavy cropping, late sorts, in this particular. All things considered it deserves a place very near the head of the list.

Stoneroad's Main Crop Nos. 1 *and* 2. (Stoneroad). Two midseason, strong growing, white varieties, of considerable merit. Both have given good yields three seasons, and stand rather above the average. No. 2 has produced slightly more than No. 1. Both are of good quality and keep well.

Vick's Early Pride. An early variety, resembling the Early Rose, and ripening at about the same time. It seems to yield more than that variety, and may prove to be superior to it.

Victor Rose (Dibble). A midseason, rose colored potato, of vigorous habit of growth; resists blight longer than most kinds. It gives about an average yield of shapely potatoes of good quality, with a small per cent. of unmarketable tubers.

Van Orman's No. 99. (Van Orman). This variety has been tested in a small way, one season only. It is an early white variety of considerable promise, especially because of extreme earliness and shapely tubers. It appears to be the earliest of any white variety thus far tested. It yields well for such an early ripening kind.

Wolfgang. An unnamed, early ripening sort, of the Early Rose type, received from H. G. Wolfgang, for trial. It resembles the early Everitt in form. It gave an exceptionally high yield on a small plot, and it remains to be seen what it will do on larger areas and in other soils and seasons, but it appears to have considerable merit. Quality good.

Wood's Earliest. (Wood). A free growing, comparatively prolific, early white variety. It seems to have considerable merit, because of its earliness, but further comparison with other varieties is necessary.

Wise. (D. W. Wise). A very vigorous and prolific, second early variety. The tubers are rather long and quite thick, slightly flattened; ends nearly square, sometimes tapering; eyes rather deep; skin pink, almost white. It is said to grow prongy sometimes, but that tendency has not been observed here. This variety has a local reputation in Ashland county, and has been on trial only one season here, but judging from reports and its behavior here it has more than ordinary merit. It keeps well and is of good quality.

FERTILIZER EXPERIMENTS.

Experiments with fertilizers are now carried on at the Central Station at Wooster, on a clay loam, known as oak and chestnut land; at the Northwestern Sub-Station at Neapolis, on yellow sandy soil and at the Northeastern Sub-Station at Strongsville, on a heavy clay soil.

The plots at the Central Station are $\frac{1}{10}$ of an acre each and at the sub-stations $\frac{1}{20}$ of an acre each.

The rotation is potatoes, wheat and clover. The following is a plan of the work for potatoes:

Plot 1. Unfertilized.
" 2. Superphosphate, 160 pounds.
" 3. Muriate of potash, 100 pounds.
" 4. Unfertilized.
" 5. Nitrate of soda, 80 pounds.
" 6. Superphosphate, 160 pounds; Nitrate of soda, 80 pounds.
" 7. Unfertilized.
" 8. Superphosphate, 160 pounds; Muriate of potash, 100 pounds.
" 9. Nitrate of soda, 80 pounds; Muriate of potash, 100 pounds.
" 10. Unfertilized.
" 11. Superphosphate, 160 pounds; Nitrate of soda, 80 pounds; Muriate of potash, 100 pounds.
" 12. Superphosphate, 160 pounds; Nitrate of soda, 160 pounds; Muriate of potash, 100 pounds.
" 13. Unfertilized.
" 14. Superphosphate, 320 pounds; Nitrate of soda, 160 pounds; Muriate of potash, 200 pounds.
" 15. Superphosphate, 480 pounds; Nitrate of soda, 320 pounds; Muriate of potash, 300 pounds.
" 16. Unfertilized.
" 17. Unfertilized.
" 18. Unfertilized.
" 19. Unfertilized.
" 20. Superphosphate, 80 pounds; Bran, 500 pounds; Muriate of potash, 85 pounds.
" 21. Superphosphate, 120 pounds; Linseed meal, 250 pounds; Muriate of potash, 95 pounds.
" 22. Unfertilized.
" 23. Superphosphate, 160 pounds; Dried blood, 100 pounds; Muriate of potash, 100 pounds.
" 24. Superphosphate, 160 pounds; Sulphate of ammonia, 60 pounds; Muriate of potash, 100 pounds.
" 25. Unfertilized.
" 26. Bone meal, 110 pounds; Nitrate of soda, 55 pounds; Muriate of potash, 100 pounds.
" 27. Acid Phosphate, 170 pounds; Nitrate of soda, 80 pounds; Muriate of potash, 100 pounds.
" 28. Unfertilized.
" 29. Basic slag, 130 pounds; Nitrate of soda, 80 pounds; Muriate of potash, 100 pounds.
" 30. Barnyard manure, 8 tons.
" 31. Unfertilized.

In all cases the number of pounds given means pounds per acre. It is intended that plots 20, 21, 23, 24, 26, 27 and 29 shall receive the same total quantity of nitrogen, phosphoric acid and potash as plot 11, but in different forms.

TABLE IV.—FERTILIZERS ON POTATOES AT THE CENTRAL AND BRANCH STATIONS, SHOWING THE INCREASE IN BUSHELS PER ACRE.

Plot.	Central Station, average for 1894 and 1895.	Northwestern Station, average for 1894 and 1895.	Northeastern Station for 1895.
2	28 5	8.6	16.7
3	3.9	23.4	-8.7
5	0.5	6.0	6.1
6	29.4	14.4	13.7
8	36.1	11.0	21.2
9	19.4	11.6	-8.7
11	31.2	20.8	8.0
12	51.3	24.5	31.6
14	56.2	29.8	19.9
15	66.1	36.8	45.6
20	43.0	3.2	30.6
21	37.6	18.5	14.3
23	47.0	14.7	15.5
24	47.7	11.3	31.5
26	26.1	-7.8	19.7
27	31.3	11.5	18.2
29	23.0	5.8	13.6
30	28.3	.....	23.0

The average unfertilized yield at the Central Station for the two seasons was 112.4 bushels; at the Northwestern Sub-station 74.4 bushels, and at the Northeastern Sub-station 59.8 bushels per acre for 1895.

It should be stated that the land at the Northwestern Sub-station has been recently cleared and is not thoroughly subdued, hence irregularities in yield, while at the Northeastern Sub-station it was necessary to use a timothy sod for potatoes, and it was not possible to get it into a good condition for the crop. In most cases the per cent. of gain was higher at the Central Station than at the Northwestern Sub-station and lower than at the Northeastern Sub-station, but there are some exceptions.

The greatest profit in the use of fertilizers was found in every case at the Central Station. If we compare the cost of the increase in the use of the various fertilizers we find that superphosphate alone added to the crop at the least cost per bushel. At the Central Station there was an increase of crop in the use of superphosphate of 28.5 bushels, at a cost of $1 44, or about 5 cents per bushel. At the Northwestern Sub-station the cost of the increase was a little more than 16 cents per bushel, and at the Northeastern Sub-station about 8 cents.

Muriate of potash has increased the crop somewhat, and apparently most on the sandy soil, but as the results are contradictory it is not possible to interpret them. On the average its use has given no profit.

Nitrate of soda seems to have been almost entirely lost on the crop thus far when used alone. When muriate of potash has been used with

superphosphate there has been an increase in the crop more than their use separately seemed to indicate, and the same is in a measure true of nitrate of soda. When the three were used in combination, and in larger quantities, up to 1,100 pounds per acre, the increase in bushels has kept pace with the added quantities of fertilizers. In 1894 the greatest profit was realized in the use of the largest quantity of fertilizers, with potatoes at 50 cents per bushel, but in 1895 the increase was secured at a cost of about 30 cents per bushel,which left no margin for profit, reckoning potatoes at market value.

The combination of superphosphate, muriate of potash and nitrate of soda has, at the Central Station, increased the crop at a cost of about 19 cents per bushel, but on the average the cost of the increase has been nearly 10 cents per bushel more than that.

Where sulphate of ammonia has been substituted for nitrate of soda, the cost of the increase has been lowered to about 12 cents per bushel, and the same figures hold good for dried blood, used in the place of nitrate of soda. Where acid phosphate has been used the cost of the increase in the average for two years at the Central Station has been about 20 cents per bushel, and for basic slag about 25 cents. The average in all of the experiments with these two has been 22.2 and 29.2 cents per bushel respectively.

With potatoes at the selling price in 1894 there was a handsome profit in the use of all of the various mixtures, and averaging the results of two seasons and taking the average price for potatoes there is still a fair profit; but with the selling price of potatoes at 25 to 30 cents per bushel, as in 1895, the profit in most cases disappears, and seems to be dependent almost wholly upon the presence of phosphoric acid. Thus far in all of our experiments, at Columbus as well as here and at the branch stations, phosphoric acid has been the controlling factor in the increase of the potato yields. It has not produced crops equal to a complete fertilizer, but while it alone has always shown a profit, the addition of the other elements has not always made the profits larger.

It is too early to discuss this matter from the results of our own experiments, but the evidence that we have thus far seems to indicate that a complete fertilizer, high in phosphoric acid and nitrogen, and low in potash has given the best results.

These matters will be discussed more fully in a bulletin on fertilizers.

SUMMARY.

Variety trials of potatoes have been made at the Central Station, on a clay loam, at the Northwestern Sub-station, on a sandy soil and at the Northeastern Sub-station on a heavy clay soil.

The plan of work is to devote about $\frac{1}{60}$ of an acre to each plot, and to duplicate the tests, at each place, as far as possible.

Varieties are known to vary on different soils, but it is an error to suppose that this is the prime cause of variation, and that all are alike as to variability.

If these suppositions were true, then no variety trial would have either local or general value.

The fact that some varieties are quite constant in their behavior under widely different conditions, gives a clue to the determination of the best ones for the general public; but the results of a single trial must be regarded merely as suggestive, and not conclusive.

It is only by summing up of different results that variety trials can have any value, either local or general, and to secure the latter a longer time is required, with a correspondingly reduced list.

The varieties which have stood the highest in yield at the Central Station in 1894 and 1895 are American Wonder, Columbus, Early Norther, Forest Rose, Irish Daisy, King of the Mammoths, Koshkonong, Stoneroad's Nos. 1 and 2, Sir William, Van Orman's Superb, Victor Rose, Wilson's First Choice, World's Fair, Wisconsin Beauty.

Those which have fallen below the average are Badger Belle, Burpee's Extra Early, Crown Jewel, Early Ohio, Everitt's Six Weeks, Minister, Salzer's Earliest.

The varieties which have averaged highest at the Central and both Sub-stations are American Wonder, Columbus, Irish Daisy, Koshkonong, Sir William and Stoneroad's No. 2.

It is clear, from our trials, that comparatively few varieties show any degree of uniformity, and it is equally manifest that varieties are quite unlike in this respect.

As a matter of course those which are least influenced by variations in soil, climate, treatment, etc., are the most valuable, and the above results may be taken as evidence which is not conclusive but suggestive.

Trials made with second crop southern seed and northern seed of the same varieties, have shown no decided differences in the yield from either, nor in earliness.

Our own seed, if well kept, seems to be as good as that from either source.

The following varieties seem to have considerable merit, although not sufficiently tested: Acme, Bovee, Carman No. 3, Early Everitt, Great Divide, Onward, Somerset, Van Orman's No. 99, Wolfgang, Wise.

In the following lists designated A, B, C, D and E are grouped varieties which resemble each other closely, although they may be of distinct origin:

A. Banner, Carman No. 3, Harvest King, Peerless Jr., Rural New Yorker No. 2.

B. Early Cyclone, Early Harvest.

C. Early Ohio, Everitt's Six Weeks, Ohio Jr., King of the Earliest.

D. Maggie Murphy, Lightning Express.

E. Salzer's Earliest, Stray Beauty, Bliss' Triumph.

In the use of fertilizers the lowest cost per bushel of increase in crop has been attained in the use of superphosphate alone, but the greatest gain per acre has been with 1,100 pounds per acre of fertilizer containing phosphoric acid, nitrogen and potash.

Muriate of potash and nitrate of soda when used alone have not given a profitable increase, but have proved beneficial in connection with superphosphate.

Phosphoric acid seems to have been the controlling element in an increase in the potato crop in all of our experiments.